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## C-A OPERATIONS PROCEDURES MANUAL

### 2.36 Lock and Tag Program for Control of Hazardous Energy

Text Pages 2 through 11

Attachments

#### Hand Processed Changes

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Approved: \_\_\_\_\_ *Signature on File* \_\_\_\_\_  
Collider-Accelerator Department Chairman      Date

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## 2.36 Lock and Tag Program for Control of Hazardous Energy

### 1. Purpose

- 1.1 This document covers generic lock and tag (LO/TO) procedures and requirements, for servicing and maintaining machines and equipment, in which the unexpected energization or start-up, of the machines or equipment, or the release of stored energy, could cause injury to employees.
- 1.2 The program applies to all types of energy sources, such as electrical, mechanical, hydraulic, pneumatic, chemical, or thermal. Appropriate procedures should be implemented for specific machines and equipment

#### Note:

A specific LOTO procedure is required if any of the following conditions exist: (1) The machine or equipment has the potential for stored or residual energy, or the re-accumulation of stored energy after shut down, which could endanger employees, (2) the machine or equipment has multiple energy sources, (3) a single lockout device will not achieve a locked-out condition, (4) Group Lockouts.

### 2. Authority and Responsibilities

All employees must comply with the lock and tag procedures. No employee shall attempt to start, energize, or use machinery or equipment that is locked or tagged out of service. Nor shall any employee attempt to defeat a lock or remove a tag without proper authorization.

#### 2.1 Authorized Employee

C-A requires that only an authorized employee shall apply the lock and tag. To become authorized an employee must receive training and be listed by the department, group, or shop responsible for the particular equipment. If you are authorized for this particular equipment, proceed with the lock and tag according to the appropriate procedure.

BNL defines **two** classes of "authorized employees."

- 2.1.1 **"Knowledgeable Employee"** - Knowledgeable employees' names are carried on an Organizational list as having received formal coursework in lockout and tag out, and formal training, or documented "hands-on experience", in safety-related technical aspects of the equipment. The authorization of these employees to

conduct lockout/tag out is limited in that they cannot install "group or operations locks and/or tags." However, they are authorized to attach additional locks and tags in "group lock", or "operations lock" situations, provided that their lock and tag is not the first applied or the last one to be removed.

- 2.1.2 **"Responsible Employee"** - Responsible employees' names are carried on an Organizational list as having received formal coursework in lockout and tag out, and formal training, or documented "hands-on experience", in safety-related technical aspects of the equipment. They also have been trained to exercise group and system-level judgments. These employees are authorized to lockout and tag out any equipment for which they have organizational approval. If coordinated multiple locks and tags are applied by more than one employee, those of the "responsible employee" is the first to be applied and the last to be removed.

## 2.2 **Affected Employee**

An employee whose job requires operating or using a machine or equipment on which maintenance, servicing, or construction is being performed under lockout or tag-out, or whose job requires work in an area in which such servicing or maintenance is being performed. An "affected employee" need only be able to recognize when the energy control procedure is being implemented, to identify the locks or tags being used, to understand the purpose of the procedure and the importance of not attempting to start up or use the equipment that has been locked out or tagged out. The "affected employees" are personnel who will not actually perform service. To become an "affected employee", an employee must receive training.

## 2.3 **Supervisor**

- 2.3.1 The Supervisor of each group within the Department, who utilizes LOTO, shall maintain a LOTO log. This log shall be used to record LOTO tags and locks applied to equipment. It shall be reviewed annually by the Supervisor to verify the status of locks and tags utilized during the required review period.
- 2.3.2 Supervisors are responsible to document in the form of a memo, annually, the competency of their workers in performing the duties of an Authorized LOTO employee within their group.

### 3. **Prerequisites**

All employees must comply with required training.

#### 3.1 Purpose of Training

The purpose of training is to ensure that the employees understand the purpose and function of the Lock and Tag Program. It shall also provide the knowledge and skills required for the safe application, usage, and removal of the lock and tag.

#### 3.2 Types of Training

##### 3.2.1 **Authorized Employees**

Each authorized employee shall be trained to recognize applicable hazardous energy sources, the type and magnitude of the energy (electrical and non-electrical), that the machine or equipment utilizes, and in the methods and means necessary for energy isolation and control. BNL's [Lock Out/Tag Out Authorized Employee Training](#)(HP-OSH-151B-W)

##### 3.2.2 **Affected Employees**

Each affected employee shall be instructed in the purpose and use of the lock and tag program. The instruction needs to be sufficient to enable the employees to determine if a control measure is in use and make them aware that disregarding or violating the prohibitions imposed by the Lock and Tag Program could endanger their own lives, or the lives of their coworkers. BNL's [Lock Out/Tag Out Affected Employee Training](#)(HP-OSH-151A-W)

##### 3.2.3 **On The Job Training**

The appropriate group Supervisor shall document in a memo to the C-A Training Manager, that an individual in their group, has demonstrated the knowledge and skills required for the safe application and usage of energy controlling devices as an Authorized employee within their group. The approval memo is required in addition to the individual being current in the Laboratory's LOTO Authorized training.

### 4. **Precautions**

4.1 The safety of personnel is of primary importance. Care should be taken not to give instructions to personnel, which might place them in the way of physical harm.

4.2 Individuals are responsible to take actions to protect themselves from danger.

- 4.3 The department, group, or shop having control over the equipment shall be responsible to develop, document, and enforce the use of the LO/TO for that equipment.
- 4.4 Restrictions placed on use of push button, selector switches, and interlocks may not be used as a substitute for lockout and tagging procedures. In general, interlocks shall not be used as a substitute for lock and tag in accordance with the above rule. In particular, door switch interlocks (on panels, cabinets, or equipment) are not acceptable as a substitute for a lock and tag. Using locks and/or tags on the interlocking device instead of on the power source device will be allowed only when *all* of the following conditions are met:
1. The interlocking device(s) is completely reliable and lockable.
  2. The interlock bypass switch(es), if any, is also lockable, and is locked out along with the interlock device.
  3. Approval has been given by the Chief Electrical Engineer.

## **5. Procedures**

### **5.1 Application of Lock and Tag**

The authorized employee shall know the type and magnitude of energy (electrical and non-electrical) that the machine or equipment utilizes and shall understand the hazards.

#### **5.1.1 Step 1: Preparation and Notification**

Identify all affected employees and notify them that a lockout and/or tagout system is going to be utilized and the reason for it. This notification can be a verbal communication.

#### **Step 2: Shutdown**

If machine or equipment is operating, shut it down using the safe and normal stopping procedure.

#### **Step 3: Isolation**

Physically locate the energy-isolating device that is needed to control the energy to the machine or equipment, or its stored energy, and operate it in such a manner as to isolate the machine or equipment from the energy source.

#### **Step 4: Lock and Tag Application**

The authorized employee shall affix his or her personal lock.

#### **Step 5: Verification of Isolation**

Prior to starting work, verify that the equipment or circuit is de-energized and isolated by doing the following:

- I. A qualified person shall operate the equipment controls or otherwise confirm that the equipment cannot be restarted.

**Caution!**

**Before testing that the circuit is de-energized, check that no personnel are exposed, and return operating control(s) to the neutral or off position after the test.**

- II. A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are de-energized. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage back feed even though specific parts of the circuit have been de-energized and confirmed to be safe. The test equipment shall be checked for proper operation immediately before and immediately after this test.

**Caution!**

**If only a tag (instead of a lock and tag) is used for energy control, re-determine that a de-energized condition exists following any absence from the work site.**

**Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and de-energization of the machine or equipment have been accomplished.**

**5.2 Release from Lock and Tag**

Upon completing the work, the authorized employees(s) shall take the following steps to restore the energy to the machine or equipment:

**Step 1:** Determine that it is safe to energize the machine or equipment, and personnel and tools are clear.

**Step 2:** Check to ensure that machine or equipment components are operationally intact, and there is no mechanical hazard.

**Step 3:** Notify operators and other affected employees that the machine or equipment is ready to be energized and the lock and tag is going to be removed momentarily.

**Step 4:** Remove the lock and tag from each energy-isolating device. The tag is to be destroyed or defaced to prevent unauthorized reuse. A lock or tag must not be removed by anyone other than the individual who installed it. Exception to this requires [C-A -OPM 2.1.4, Removal of Locks and Tags by Others](#) , be invoked.

### 5.2.1 **Removal of Locks and Tags by Other Persons**

A lock or tag must not be removed by anyone other than the individual who installed it except under the following conditions:

**Step 1:** Verify that the worker(s) who installed the lockout is not on the site.

**Step 2:** Make all reasonable efforts to contact the worker(s).

**Step 3:** The equipment in question must be needed for C-A operation, maintenance, or for personnel safety.

**Step 4:** Refer to C-A-OPM 2.14," [Removal of Locks and Tags by Others](#)"

### 5.2.2 **Shift or Personnel Change**

If a job is expected to last beyond the end of the working shift, the worker shall notify the responsible supervisor and discuss the circumstances involved. The supervisor may then decide to install a supervisor's lock and tag in addition to the worker's lock and tag to provide continuity of the lockout or have the worker keep the lock and tag on until the job is completed and the equipment is re-energized. To ensure the continuity of lockout protection at the time of shift or personnel change, transfer of lock and/or tag shall take place between going and coming workers. If the supervisor's lock and tag is installed in addition to the worker's, it may be used as a bridge for exchanging locks and tags between going and coming workers.

### 5.2.3 **Group Lockout for One Crew**

When a crew (a group of two or more persons belonging to the same or different departments working together) is involved on the job, each person must apply and remove his or her personal lock and tag. The last person removing the lock and tag shall be responsible for following all of the steps required to release equipment from lock and tag. As an alternative, the following steps may be used to make it a group lockout. Each crew member must be trained in the lock and tag procedure for the control of hazardous energy at least to the level of authorized employee.

#### 5.2.3.1 **Additional Requirements**

**Step 1:** Equipment shall be de-energized and locked out from all sources of hazardous energy by a Responsible, Authorized employee(s), following appropriate procedures. Authorized employee shall keep his or her lock(s) and tag(s) in position until Step 3.

**Step 2:** The Responsible Authorized Employee shall ensure the safety of the crew by doing the following:

1. Put his or her personal lock and/or tag on the isolating device(s), and affix multiple lock hasps, if necessary.

2. Verify or observe it being verified or ensure by other means that the equipment is in the de-energized condition.
3. Have each worker on the crew affix his or her personal tag (lock for each worker is not necessary) on the group lockout device, master lockbox, satellite lockbox, or comparable mechanism when he or she begins work.
4. Have each worker on the crew remove his or her personal tag when he or she finishes work and is safe.
5. The Responsible, Authorized employee removes his or her own lock(s) and/or tag(s) only after all workers have removed their tags, and it is safe for all workers.

**Step 3:** The authorized employee(s) who had affixed the initial lock and tag in Step 1 following the appropriate procedures shall then release equipment from lock and tag.

#### 5.2.4 **Group Lockout for Multiple Crews**

When more than one crew is involved, each person must apply and remove his or her personal lock and tag. The last person removing the lock and tag shall be responsible for following all of the steps required to release equipment from lock and tag.

As an alternative, the following steps may be used to make it a multiple crew group lockout. A Responsible Authorized Employee will be responsible for the overall coordination of the lockout of the equipment. The Responsible Authorized Employee may not necessarily be a member of a crew (such as the Maintenance Coordinator) and shall do the following to ensure the continuity of the protection:

**Step 1:** Place his or her personal lock with tag on the isolating device(s), a master lockbox, or a comparable mechanism after the equipment has been locked out by an authorized employee(s).

**Step 2:** Coordinate the activities of lockout placement and removal.

**Step 3:** Upon completion of work after all other workers have removed their lockout devices, the Responsible, Authorized Employee, who applied the Lockout in Step 1, shall determine that it is safe to re-energize and proceed according to procedures for releasing from lock and tag. The Authorized Responsible Employee may use Department/Group locks-tag(s) on the equipment instead of his or her personal lock. The key(s) of the shop-lock(s) must then be placed in a lock box controlled by a personal lock and tag of the Authorized Responsible Employee.

#### 5.2.5 **Outside Service or Contractor Personnel**

Personnel not supervised by BNL Employees, outside service or contractor personnel, who are involved in operations relating to equipment or machinery lockout that affects BNL employees, must submit their energy control (lock and tag) procedures to the BNL Construction Safety Engineer. The contractor shall ensure that his or her employees working



on the site are instructed about the program and the prohibition relating to attempts to restart or re-energize machines or equipment, which are locked or tagged out. BNL shall notify the cognizant manager(s) of the affected area(s) about the outside employer's energy control program.

The cognizant manager(s) shall ensure that the affected employees understand and comply with the restrictions and prohibitions of the outside employer's energy control program. The manager(s) shall also ensure that the affected employees are informed of the type of lock, tag, and other pertinent contractor's procedures by implementing Enhanced Work Planning.

#### **5.2.6 If Device is Not Capable of Being Locked Out**

If an isolating device is not capable of being locked out, affix a tag without a lock, and supplement it with at least one of the following additional safety measures:

1. Lock and tag an upstream isolating device.
2. Remove and tag an isolating circuit element, such as a fuse, jumper, or conductor.
3. Locate an additional isolating device which is independently capable of isolating the machine or equipment. Operate it to safe or off position and place a tag on it.
4. Remove a valve handle and tag the valve stem to reduce the likelihood of inadvertent energization.
5. "Blank" or "blind" a pipeline or a duct to isolate source of energy and attach a tag.
6. Block and tag or lock and tag a controlling switch such as a stop push-button to prevent energization of the machine or equipment which is being worked on.
7. Post a safety guard at the isolating device to make sure that the device is not operated and the machine or equipment remains de-energized.

If a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

#### **5.2.7 New Equipment or Major Modification to Equipment**

Whenever replacement or major repair, or renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment shall be designed to accept a lockout device

## 5.2.8 Lock and Tag Devices

### 5.2.8.1 Padlocks

Padlocks used for lock and tag shall be a Master pad lock having a red color band.

They are available from the C-A Safety Office, room 129, building 911.

Padlocks shall be used as follows:

1. Padlocks are identified with the individual's BNL Life Number of the individual applying them.
2. Padlocks shall always be accompanied with a lockout tag (see [Section 5.2.9, "Tags"](#)).

For small jobs that can be completed within a shift, such as lubrication of a mechanical pump, it is not necessary to apply a tag. Otherwise, a tagout tag is required along with the padlock to provide documented information regarding who applied the lockout/tagout, and when and why lockout/tagout was applied. The tagout device must be attached at the same location as the energy-isolating device, or as close as possible to the energy-isolating device.

3. A duplicate key, which may be used to remove locks according to Section 5.2.1, "Removal of Locks and Tags by Other Persons," is available through C-A ESH&Q.
4. Padlocks shall be used exclusively for hazardous energy lockout, and not for any other purpose

### 5.2.8.2 Built-in Locks

If an isolating device has a built-in locking mechanism, such as a Kirk-key lock, then it can be used as a locking device and it is not necessary to affix an additional padlock. A personal tag properly dated and signed must be attached to the built-in lock to indicate that work is being done on the circuit or equipment. If there is more than one person involved, the Kirk-key (or a similar device) shall be placed in a lockbox and then each crew or person shall affix a lock and tag to the box according to the group lockout rule (see Section 5.2.3, "Group Lockout for One Crew," and Section 5.2.4, "Group Lockout for Multiple Crews").

## 5.2.9 Tags

Lockout tags:

1. Shall be [BNL LO/TO Tag](#) or equivalent tags generated using C-A OPM 2.36 "WinSTETS".
2. Shall be documented and recorded in a logging system.
3. Shall be protected from the environment.
4. Should be numbered and controlled by the department.

5. Shall be used exclusively for hazardous energy lockout (Personnel Protection).
6. Shall be attached by a nylon cable tie such that it takes at least fifty pounds of strength to remove it. If a cable tie is not available, an environmentally tolerant, self-locking, attachable by hand, non-reusable attachment cable with a minimum unlocking strength of fifty pounds may be used. A tag may be installed directly on the lock.

### 5.3 **Periodic Inspections**

- 5.3.1 The Department shall perform an annual assessment of the LOTO procedure to ensure that the procedure and its requirements are being followed.
- 5.3.2 The annual assessment shall be performed by an authorized employee other than the personnel utilizing the LOTO procedure.
- 5.4 The Supervisor of each group within the department who utilize LOTO shall maintain a LOTO log. The Supervisor shall annually review the log. This review is used to:
  - 5.4.1 Verify that tags and locks have been removed from equipment on closed out LOTOs.
  - 5.4.2 Verify that tags and locks are in place on equipment if the LOTO is open for greater than one year. The Supervisor performing the review of open LOTOs shall document the review in the log by entering initials and date of the review.
- 5.5 Any deviations or inadequacies identified during the annual assessment shall be corrected.
- 5.6 All Authorized and Affected employees of the department shall annually review their responsibilities under this LOTO procedure including the use and limitations of tags.

## 6. **Documentation**

None

## 7. **References**

- 7.1 ESH Standard 1.5.1 "Lockout /Tagout Requirements"
- 7.2 C-A-OPM 2.37 "WinSTETS"

## 8. **Attachments**

None